

I. INTRODUCTION

The California Coronary Artery Bypass Graft Mortality Reporting Program

The California Coronary Artery Bypass Graft Mortality Reporting Program (CCMRP) is a voluntary statewide hospital reporting program designed to collect and report coronary artery bypass graft (CABG) operative mortality at the hospital level. CCMRP produces uniform, hospital-level mortality rates, adjusted to account for differences across hospitals in the mix of patients undergoing CABG surgery. The project was established in 1995 by the Pacific Business Group on Health (PBGH), a statewide coalition of purchasers of care, and the Office of Statewide Health Planning and Development (OSHPD), the California state department responsible for reporting risk-adjusted hospital outcomes data. The California Chapter of the Society for Thoracic Surgeons (CASTS) and the national Society of Thoracic Surgeons (STS) assisted with the initial implementation of this program and they continue to provide input through the Technical Advisory Panel (TAP).

PBGH and OSHPD selected CABG surgery because it is a frequently performed and costly procedure. Based on data from OSHPD's 2001 Patient Discharge Database (PDD), 25,932 isolated⁷ coronary artery bypass graft surgeries were performed at 119 California hospitals.⁸ For 2001, the average hospital charge for a bypass procedure was approximately \$129,770 (OSHPD, 2001).⁹ For some hospitals, only births comprised a larger proportion of their total revenue.

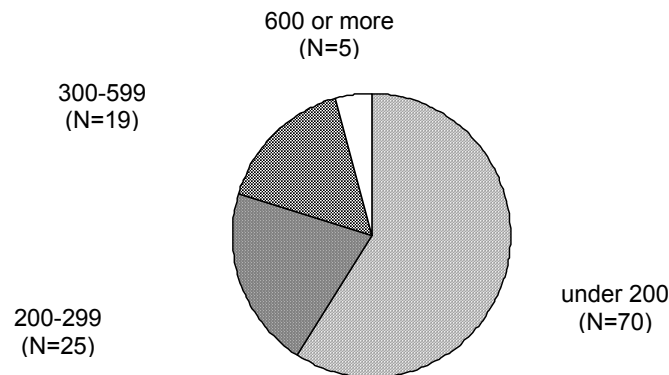
A number of studies have examined the relationship between the volume of CABG surgeries and mortality. These studies find that, on average, mortality rates are higher at low volume hospitals as compared to high volume hospitals (Farley, 1992; Hannan et al., 1989; Hannan et al., 1991; Showstack et al., 1987; Dudley et al., 2000). While some low volume institutions do achieve good outcomes, there is particular concern for possible quality of care problems among the smallest volume hospitals. The Leapfrog Group, a national coalition of organizations dedicated to improving patient safety, established a volume threshold of 500 cases per year for hospitals performing bypass surgery, citing the clinical evidence supporting better outcomes at larger volume institutions (www.leapfroggroup.org, 2002). The American College of Cardiology *Guidelines for Coronary Artery Bypass Graft Surgery* (Eagle et al., 1999) note potential concern for hospitals and/or surgeons who perform fewer than 100 cases annually and recommend monitoring the performance of these institutions and surgeons. Surgical volume and its relationship to quality is a concern in California given the substantial number of hospitals with low annual CABG volumes. Figure 1 shows, for 1999, 70 out of the 119 California hospitals (59%) performed fewer than 200 surgeries. Of these 70 hospitals, 28 performed 100 or fewer surgeries annually. The performance of many low volume hospitals remains unknown, as they were less likely to participate in CCMRP.

⁷ Isolated means that no patient received both a CABG and an additional major procedure such as a valve repair or replacement during the same operation (see Appendix A for isolated CABG definition). Isolated CABG surgeries comprise the majority of heart operations in California and the U.S.

⁸ All 119 hospitals performed at least 25 adult isolated CABG surgeries each during 1999.

⁹ Source: 2001 OSHPD PDD. Calculations refer to total charges per discharge for all patients who had an isolated CABG procedure as defined in Table 1. The 2001 figure includes charges for CABG cases that may have had post-surgical complications and required other procedures or treatment during the same admission. It excludes 2,400 cases for 2001 where there was a \$0 charge amount (i.e., Kaiser facilities). The calculation of the charge figure differs from that reported in the 1997-1998 CCMRP Technical Report, which only included charges for CABG surgeries without major complications. Few hospitals actually receive payment in the amount represented by charges. Reimbursement rates are negotiated between health plans and hospitals and typically are much lower than charges.

**Figure 1: California Hospital Isolated CABG Surgery Volumes,
2001 OSHPD Patient Discharge Data**



The Need for Comparative Outcomes Data

Individuals and employers—who often serve as purchasing agents for employee and dependent populations—face difficulties in making informed healthcare purchasing and treatment decisions. Rarely is comparative information on health outcomes readily available to help guide consumer and purchaser choice in the marketplace. Consequently, purchasing and treatment decisions typically are based on price alone and not on the overall value of services—a key component of which is the quality of care. Recent decisions by health plans to establish tiered hospital networks further underscore the importance of having reliable performance information. In the absence of outcomes data, plan decisions about which tier a hospital is placed into will be determined by price alone—which neither benefits patients nor rewards hospitals with better outcomes.

Most importantly in our efforts to promote the delivery of high quality care, there is a need among California hospitals and surgeons for comparative performance data. This type of information is lacking for all hospital procedures with the exception of bypass surgery and acute myocardial infarction. Performance information is vital to helping hospitals understand where quality of care problems may exist and to targeting improvement efforts. Measurement and public accountability are powerful stimuli in driving quality improvements in all sectors, including healthcare (Hibbard et al., 2003).

To make comparative quality information available to patients and purchasers, and to physicians and hospitals so they can engage in continuous quality improvement, PBGH and OSHPD established CCMRP. CCMRP reports, on a periodic basis, risk-adjusted mortality rates for isolated CABG surgery at each non-federal hospital in California that performs adult CABG surgery, has voluntarily agreed to provide data to the reporting system, and participates in an independent audit of these data.

In-hospital mortality was selected as a measure of hospital quality for isolated CABG surgery because it can be reliably measured and affords comparability across hospitals. It should be noted that mortality is not the only measure of the quality of bypass surgery. Process measures

and complications are also important quality indicators; however, these measures are difficult to ascertain in a reliable and consistent fashion across institutions to permit fair comparisons. The New York Department of Health's CABG reporting program has attempted the collection and comparison of complications data but found wide variation in reporting practices (i.e., significant under-reporting of complications) across hospitals, making uniform comparisons problematic.

Goals of CCMRP

CCMRP aims to provide comparative risk-adjusted mortality rates to:

- **Hospitals and providers:** to stimulate and facilitate quality review of surgical procedures and processes of care that will lead to improved outcomes;
- **Purchasers of care:** to promote public accountability and to incorporate quality measures into purchasing decisions; and
- **Patients and their family members:** to understand differences in surgical outcomes across hospitals so that they can make more informed treatment decisions.

CCMRP Technical Advisory Panel

CCMRP has a Technical Advisory Panel comprised of cardiac surgeons, cardiologists, clinicians and health services researchers with expertise in quality of care and risk adjustment. Its role is to provide ongoing guidance to PBGH and OSHPD regarding the design and implementation of the program—including defining the outcome measure and purpose of the reporting program, selecting data elements, and providing recommendations regarding data collector training and data audits to ensure the quality of the data. Additionally, the advisory panel reviews and comments on the analysis plan, study findings, and the presentation of results.

Guide to Using this Report

Section II explains recruitment and participation of hospitals in the program. Section III describes the data selection, collection and verification processes undertaken in 1999. Section IV describes the methods CCMRP used to adjust hospital mortality data and tabulates the resulting risk-adjusted hospital mortality rates for 1999. Section V presents the risk model and risk-adjusted results for the aggregated data from 1997-1999. Section VI describes the model fit and calibration. Section VII explores the relationship between hospital volume and outcome for CABG procedures. Appendices A-G provide detailed technical and operations information. Not included in this report, but available through the OSHPD Web site is a detailed description of the 1999 medical records audit and the analyses of those data (www.oshpd.state.ca.us).

